



“Gheorghe Asachi” Technical University of Iasi, Romania



KINETIC CONSTANTS DETERMINATION OF PETROLEUM REFINERY EFFLUENT TREATMENT IN A UASB REACTOR USING RSM

**Seyed Omid Rastegar¹, Seyyed Mohammad Mousavi^{1*},
Seyed Abbas Shojaosadati¹, Soheila Sheibani²**

¹Tarbiat Modares University, Chemical Engineering Department, Biotechnology Group, Tehran, Iran

²National Iranian Oil Refining and Distribution Company, R&T Management Department, Tehran, Iran

Abstract

In this study, an upflow anaerobic sludge blanket (UASB) bioreactor at the mesophilic temperature (38°C) was successfully used for the treatment of petroleum refinery effluents. Response surface methodology (RSM) was applied for the design and analysis of experiments to predict the behavior of the initial COD and the hydraulic retention time (HRT) in the bioreactor. A statistical analysis indicated that the models adequately represented the experimental data. At the optimal conditions, the effluent COD was 120 mg/L, the VSS effluent was 0.4 mg/L and the biogas rate was 0.025 L biogas/L feed. day. The Monod, First-order, Grau and modified Stover-Kincannon models were applied to determine the substrate removal kinetics in the reactor. The results obtained were described the best by the modified Stover-Kincannon model. The kinetic of methane production was also studied. The product yield coefficient, Y_M , was 0.69 LCH₄/g COD_{removed}.

Key words: kinetic evaluation, UASB reactor, methane production, petroleum refinery effluent, RSM

Received: September, 2012; Revised final: August, 2013; Accepted: August, 2013

* Author to whom all correspondence should be addressed: e-mail: mousavi_m@modares.ac.ir; Phone: +98-21 82884917; Fax: +98-21 82884931